IN THE CLAIMS

Please cancel claims 1-9 and add the attached new claims 10-18 (pages 3-5).

REMARKS

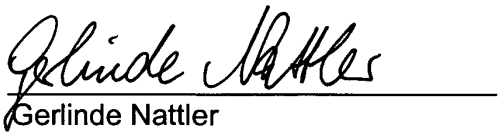
Prior to a formal examination of the above-identified application, acceptance of the new claims and the enclosed substitute specification (under 37 CFR 1.125) is respectfully requested. It is believed that the substitute specification and the new claims will facilitate processing of the application in accordance with M.P.E.P. 608.01(q). The substitute specification and the new claims are in compliance with 37 CFR 1.52 (a and b) and, while making no substantive changes, are submitted to conform this case to the formal requirements and long-established formal standards of U.S. Patent Office practice, and to provide improved idiom and better grammatical form.

The enclosed substitute specification is presented herein in both marked-up and clean versions.

STATEMENT

The undersigned, an agent registered to practice before the Office, hereby states that the enclosed substitute specification includes the same changes as are indicated in the marked-up copy of the original specification. It does not contain new subject matter.

Respectfully submitted,



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SUBSTITUTE SPECIFICATION
MARKED VERSION

~~Pe 10719~~

HYDRAULIC UNIT

BACKGROUND OF THE INVENTION

The present invention relates to a hydraulic unit for a slip-controlled brake system ~~according to the preamble of patent claim 1~~ with an accommodating member accommodating inlet and outlet valves in several valve accommodating bores of a first and second valve row, with a pump bore arranged outside the two valve rows in the accommodating member, the pump bore being aligned transversely to the direction in which the valve accommodating bores open into the accommodating member, with two hollow-cylinder shaped noise damping chambers connected to the pump bore and having a hydraulic connection with two brake pressure generator connections that open into the accommodating member, with several pressure fluid channels connecting the valve accommodating bores and the pump bore and being able to establish a hydraulic connection between the brake pressure generator connections opening into the accommodating member and the wheel brake connections.

A hydraulic unit of the above-mentioned type is disclosed in WO 91/16220. It is proposed in this publication to arrange the noise damping chambers in parallel to the low-pressure accumulator bores which are, thus, aligned jointly in a row that is lateral relative to a pump bore. The pressure fluid channels for the brake pressure generator connections at the block-shaped accommodating member vertically traverse the valve accommodating

bores provided for the inlet valves and extend laterally past the pump bore into the bottom area of the noise damping chambers. In parallel to each pressure fluid channel opening into the noise damping chamber, there extends for each brake circuit another vertical pressure fluid channel which exclusively connects the pump bore with the noise damping chamber.

Consequently, this causes a complicated type of construction in order to realize the necessary noise damping chambers and the low-pressure accumulator bores. On the other hand, a considerable volume of chips must be removed from the block by means of a multitude of different drilling operations from different directions. The result is that sophisticated measures are needed, in particular for manufacturing the noise damping chambers and the necessary pressure fluid channels. Besides, the selected distribution of the valve rows necessitates distributing the wheel brake connections on both lateral surfaces of the block-shaped accommodating member so that a connecting pattern for the pipe line system (brake conduits) results on three lateral surfaces of the accommodating member. This configuration in turn requires larger space, and the necessary assembly steps increase.

In view of the above, an object of the invention is to manufacture a hydraulic unit of the indicated type in a smallest possible size and at low cost.

In particular the manufacturing effect needed for connecting the noise damping chambers to the brake pressure generator connections shall be simplified, and also the hydraulic connections of the pump bore to the noise damping chambers as well as the connection of the low-pressure accumulator bores to the noise damping chambers by way of the pump bore shall be realized as simply as possible.

SUMMARY OF THE INVENTION

This object is achieved for a hydraulic unit of the indicated type ~~using the characterizing features of claim 1~~ in that the two noise damping chambers (6) are arranged between the pump bore (3) and the brake pressure generator connections (THZ), and in that a pressure fluid channel (3') respectively designed as a blind-end bore extends from a brake pressure generator connection (THZ) arranged transversely to the valve accommodating bores (2) through respectively one of the two noise damping chambers (6) until into the pump bore (3).

Further features, advantages and possible applications of the invention ~~can be seen in the sub-claims and~~ will be explained in the following by way of the description of several embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

Figure 1 is a first perspective view of the block-shaped hydraulic unit with a top view of the top side of the block equipped with the motor accommodating bore;

Figure 2 is a second perspective view of the block-shaped hydraulic unit with a top view of the bottom side of the block into which the valve accommodating bores open;

Figure 3 is a partial view of the bore arrangement in the block, as shown in Figure 1, in the area of the first valve row accommodating the inlet valves, in a hydraulic connection to the noise damping chambers and the pump bore;

Figure 4 shows, based on Figure 4, a cross-section taken through the hydraulic unit;

Figure 5 is a perspective view of the top side of the hydraulic unit, of the two valve rows with the valve accommodating bores, the wheel brake connections and the pressure fluid channels connected to the valve rows;

Figure 6 shows, based on Figure 5, the pressure fluid channels leading from the second valve row to the low-pressure accumulator bores.

DETAILED DESCRIOTION OF THE DRAWINGS

Figures 1 and 2 show in each case a view of the top side or bottom side of a hydraulic unit for a slip-controlled brake system, including a block-shaped accommodating member 1 accommodating inlet and outlet valves in several valve accommodating bores 2 of a first and second valve row X, Y. Outside the two valve rows X, Y, the accommodating member 1 includes a pump bore 3 which extends transversely to the direction in which the valve accommodating bores 2 open into the accommodating member 1. The second valve row Y is arranged directly adjacent to the pump bore 3, while the first valve row X is arranged remote from the pump bore 3 directly adjacent to the brake pressure generator connections THZ that open into the lateral surface of the accommodating member 1 and, hence, open into another end surface opposite to the end surface that includes the low-pressure accumulator bores 5. Outside the two valve rows X, Y, a motor accommodating bore 4 can be seen in Figure 1, which opens perpendicularly into the pump bore 3 at half the length of the pump bore. Pump bore 3 separates the two valve rows X, Y in the accommodating member 1 from the low-pressure accumulator bores 5 which point into the accommodating member 1 vertically to the axes of symmetry of the valve

accommodating bores 2 and vertically to the longitudinal axis of the pump bore 3. Several pressure fluid channels 2', 3', 5' that connect the valve accommodating bores 2, pump and low-pressure accumulator bores 3, 5 provide a hydraulic connection between two brake pressure generator connections THZ disposed in the accommodating member 1 and the four wheel brake connections HR, HL, VR, VL.

In addition, two hollow-cylinder shaped noise damping chambers 6 are arranged beside the pump bore 3 and are directly connected to the two brake pressure generator connections THZ that open into the accommodating member 1 by way of the pressure fluid channels 3' that extend transversely to the pump axis. Provided between each low-pressure accumulator bore 5 and the pump bore 3 is a pump suction channel 5' which opens at right angles into the pump bore 3 and is machined inside the pump bore preferably in a peripheral milling operation.

The bottom side of the accommodating member (see Figure 2) opposed to the motor housing accommodates a valve control device which additionally houses the control electronics for driving an electric motor integrated into the motor housing and provided for the radial piston pump fitted in the pump bore 3. An electric plug of the electric motor extends through a through-bore 8 disposed between the two valve rows X, Y and the two noise damping chambers 6, in order to enable the electric contacting of the electric motor with the valve control device (which covers the accommodating member 1 like a cap) on the shortest way.

According to the invention, the two noise damping chambers 6 are arranged parallel to the axis of the pump bore 3, and namely according to Figure 1 above the two valve rows X, Y and, thus, at

the level of the brake pressure generator connections THZ, while the pressure fluid channel 3' that is respectively designed as a blind-end bore extends from a brake pressure generator connection THZ, which opens in each case into the lateral surface of the accommodating member 1 transversely to the valve accommodating bore 2, through respectively one of the two noise damping chambers 6 until into the pump bore 3, what is done in an especially straightforward fashion under aspects of manufacturing technology.

Figure 3 illustrates the previously explained features that are essential to the invention by way of a perspective view of a partial area of the accommodating member 1 so that the two short pressure fluid channels 3' which are simple to make can be easily seen between the pump bore 3, the noise damping chambers, the brake pressure generator connections THZ and the valve accommodating bores 2 of the first valve row X.

Figure 4 shows a cross-sectional view of the accommodating member 1, from which the arrangement of bores in the block-shaped accommodating member 1, which is essential to the invention and has been emphasized already separately in Figure 3, becomes apparent as a cross-section taken through one of the two pressure fluid channels 3'. It can further be seen that in each case a pressure fluid channel 2', which has a particularly short size and originates transversely to the blind-end bore from the valve accommodating bore 2 receiving the inlet valve, opens into the pressure fluid channel 3', with the result that the volume of chip removal is minimized to the extent possible. Favorably, an orifice 9 is inserted into each blind-end bore of the pressure fluid channel 3' for the purpose of noise damping for each brake circuit, said orifice being pressed as a sleeve part into the

blind-end bore between the noise damping chamber 6 and the port of the pressure fluid channel 2' connected to the valve accommodating bore 2. The diameter of the noise damping chamber 6 is suitably selected to be so large that the orifice 9 can be inserted through the noise damping chamber 6 into the blind-end bore, with the result that the effort of manufacture for the arrangement of the orifice 9 is minimal.

As becomes obvious from Figures 3 and 4, the pump bore 3 has on both sides of the motor accommodating bore 4 an axle offset for shifting the axes of two pump pistons of a dual-circuit radial piston pump in order to minimize wear.

Differing from the previous Figures, Figure 5 shows only the two valve rows X, Y and the associated pressure fluid channels 2', 2''', 2'''' in a perspective view from the bottom side of the accommodating member 1, with the second valve row Y accommodating exclusively the valve accommodating bores 2 for the outlet valves, while the first valve row accommodates exclusively the valve accommodating bores 2 for the inlet valves. Due to the fact that the pump bore is arranged outside the two valve rows X, Y, the pressure fluid channels 2'''', which respectively connect a valve accommodating bore 2 of the first valve row X to a valve accommodating bore 2 of the second valve row Y, can have a configuration as short as possible in their capacity as straight bores or blind-end bores, and also the wheel brake connections VR, VL, HR, HL arranged directly beside the first valve row X are connected on the shortest way to the valve accommodating bores 2 of the first valve row X. This achieves a low effort of manufacture, unproblematic bleeding and filling with brake fluid and a low flow resistance in the pressure fluid channels 2', 2''', 2'''' during operation. To simplify the assembly, the wheel

brake connections for the wheel brake conduits are arranged partly parallel to the motor accommodating bore 4 so that two of four wheel brake connections open into the accommodating member 1 adjacent to a motor housing that projects from the motor accommodating bore 4 at the top side of the accommodating member 1.

In a structural extension of Figure 5, Figure 6 shows the return channels 5'' which lead from the second valve row Y to the low-pressure accumulator bores 5 as well as the extremely short pump suction channels 5' for both brake or pump circuits that lead to the pump bore 3. The pump suction channels 5' are connected to the low-pressure accumulator bores 5, and each one pump suction valve 10 is inserted into each pump suction channel 5'. A short flow path that is favorable in terms of flow is achieved due to the direct vicinity of the pump suction channels 5' to the pump bore 3 so that the pump aspiration losses are very low.

List of Reference Numerals:

1	accommodating member
2	valve accommodating bore
2′	pressure fluid channel
2′′′	pressure fluid channel
2″″	pressure fluid channel
3	pump bore
3′	pressure fluid channel
4	motor accommodating bore
4′	-
5	low-pressure accumulator bore
5′	pump suction channel
5″	return channel
6	noise damping chamber
7	-
8	through-bore
9	orifice
10	pump suction valve
X	first valve row
Y	second valve row
THZ	brake pressure generator connection
R1, R2, R3, R4	wheel brake connection

ABSTRACT OF THE DISCLOSURE[[:]]

~~Hydraulic Unit~~

~~The invention relates to a~~ A hydraulic unit ~~having~~ has two noise damping chambers (6) arranged between the pump bore (3) and the brake pressure generator connections (THZ), and respectively one pressure fluid channel (3') configured as a blind-end bore extends from a brake pressure generator connection (THZ), which is arranged transversely to the valve accommodating bores (2), through respectively one of the two noise damping chambers (6) until into the pump bore (3).

~~Figure 4~~